CHLORIDE

*Secure Power Always*

# **80-NET**$_{MPR}$ from 30 to 40 kVA

**UPS Catalogue**

**Important note!**

The technical data enclosed is for general information. Please note that the operating instructions and references indicated on the products are for installation, operation and maintenance.

**Product designations**

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# Uninterruptible Power Supply Systems

## UPS Catalogue • 2008

## 80-NET*MPR* from 30 to 40 kVA


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## 1 Scope

This specification describes a continuous, duty three-phase, solid state, IGBT (Insulated Gate Bipolar Transistor), double conversion, uninterruptible power supply (UPS) system. The UPS will automatically provide continuity of electrical power, within defined limits and without interruption, upon failure or degradation of the commercial AC source.
The continuity of conditioned electric power will be delivered for the time period defined by the battery system.

The rectifier, the inverter, and other mission critical converters within the UPS, are driven by vector control algorithms (covered by patents 95 P3875, 95 P3879 and 96 P3198) running on dedicated digital signal processor (DSP) systems.

## 2 System description

80-NET$_{MPR}$ is an intelligent double conversion UPS, as shown in Figure 1.

The systems will operate on a DSP-based IGBT inverter. Through Vector Control technology, the performance of the inverter will be enhanced and will be capable of providing reliable, high quality AC power. In order to increase system redundancy, an independent electronic static bypass will be integrated into the UPS. By adding system components, safety and disconnecting devices, system bypass switches, as well as software and communications solutions, it will be possible to set up elaborate systems ensuring the complete protection of the supplied loads.

### 2.1 The system

The UPS will provide high quality AC power for electronic equipment loads and will offer the following features:

- Increased power quality
- Full input Power Factor Correction (PFC) and very low THDi
- Full compatibility with any TN installation and/or any standby power generator
- Full compatibility with all types of loads
- Power blackout protection
- Full battery care
- Energy saving features
- Transformer free design (galvanic isolation transformers are available as integrated standard options)

The UPS will automatically provide continuity of the electrical power, within defined limits and without interruption, upon failure or degradation of the commercial AC source. The duration of autonomy (i.e. back up power time) in the event of a network failure will be determined by the battery capacity.

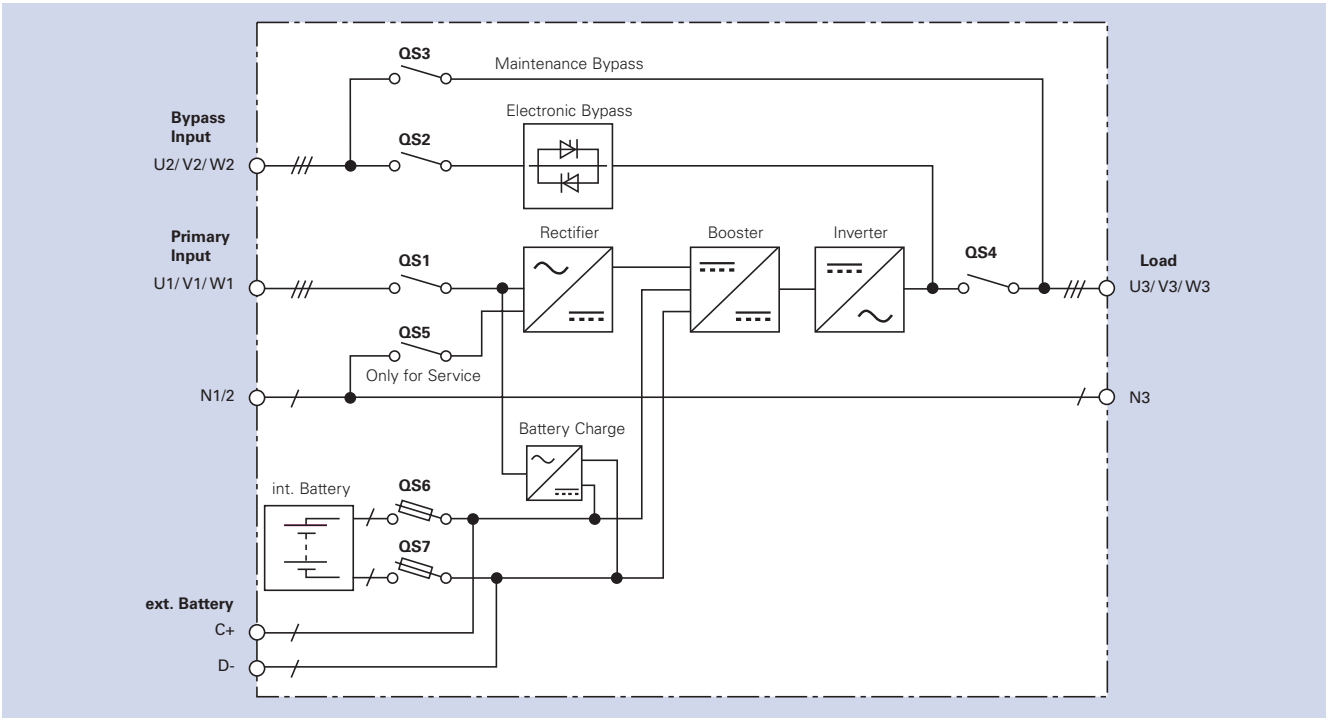


Figure 1. 80-NET$_{MPR}$ single line diagram.

## 2 System description

### 2.2 Models available

The 80-NET*MPR* range will include the following three-phase input/output models:

| MODEL | Rating (kVA) |
|---|---|
| 80-NET*MPR* /30 | 30 kVA |
| 80-NET*MPR* /40 | 40 kVA |

## 3 Device description

80-NET*MPR* is the result of an innovative research and development programme, designed to offer users the most reliable power supply, at the minimum cost and with the highest possible energy conversion efficiency.

### 3.1 Components

The UPS will consist of the following major components:

- PFC Rectifier & Booster with IGBT
- IGBT Battery Charger
- IGBT Inverter
- Dedicated digital signal processor (DSP) control
- Embedded controller for I/O interfaces
- Electronic static switch and by-pass supply
- Manual maintenance bypass switch
- Matching battery cubicles

### 3.2 Microprocessor control and diagnostics

Operation and control of the UPS will be provided through the use of microprocessor-controlled logic. Indications, measurements and alarms, together with battery autonomy, will be shown on an illuminated, graphical display (LCD). The procedures for start up, shutdown and manual transfer of the load, to and from the bypass, will be explained in clear step-by-step sequences on the LCD display.

### 3.3 Intelligent double conversion operating modes

80-NET*MPR* will adopt intelligent double conversion technology, which allows the UPS to operate in double conversion or digital interactive mode according to the selected priority. The UPS will operate as follows:

#### 3.3.1 Double Conversion Mode (DCM)

##### 3.3.1.1 Normal (DCM)

The UPS inverter continuously supplies the critical AC load. The rectifier derives power from the commercial AC source and converts it into DC power for the inverter. The Battery Charger keeps the Battery in a fully charged and optimum operational condition. The inverter converts the DC power into clean and regulated AC power which is supplied to the critical load (conditioned line). The static switch monitors and ensures that the inverter tracks the bypass supply frequency. This ensures that any automatic transfer to the bypass supply (due to an overload etc.) is phase and frequency synchronised and does not cause an interruption to the critical load.

##### 3.3.1.2 Overload (DCM)

In the event of an inverter overload, manual stop or failure, the UPS automatically transfers the critical load to the bypass line (if available) without interruption.

##### 3.3.1.3 Emergency (DCM)

Upon failure or reduction of the commercial AC source (see the Technical Data table for tolerances), the inverter will supply the critical load, drawing power from the associated battery. There will be no interruption to the critical load upon failure, reduction or restoration of the commercial AC source. While the UPS is powered by the batteries, indications will be provided of the actual autonomy time remaining as well the duration of the mains failure.

##### 3.3.1.4 Recharge (DCM)

Upon restoration of the commercial AC source, even where batteries are completely discharged, the rectifier will automatically restart and will take over the inverter and the battery charger will recharge the batteries. This function will be fully automatic.

#### 3.3.2 Digital Interactive Mode (DIM)

If priority has been set to digital interactive mode, the intelligent double conversion technology will allow 80-NET*MPR* to continuously monitor the condition of the input supply, including its failure rate, to ensure maximum reliability for critical users. On the basis of the analysis performed, it will decide whether to supply the load through the direct line or through the conditioned line. This operational mode, which allows significant energy savings by increasing the overall AC/AC efficiency of the UPS, up to 98%, is primarily intended for general purpose ICT applications. However, it does not provide the same output power quality as when the UPS operates in double conversion mode. It will therefore be necessary to verify whether this mode is appropriate for special applications. The digital interactive mode is not available for parallel systems.

## 3 Device description

#### 3.3.2.1 Normal (DIM)

The operating mode will depend on the quality of the mains supply from the short-term past. If the line quality has remained within the permitted tolerance parameters (see the Technical Data table for tolerances) throughout this timeframe, the direct line will provide a continuous supply to the critical AC load through the bypass static switch. The IGBT inverter control will remain in constant operation and in synchronisation with the direct line without driving the IGBT. This ensures that the load can be transferred to the conditioned line, without any break in supply, in cases where there is a deviation from the selected input power tolerance levels. If the direct line failure rate is outside the permitted parameters, the 80-NET$_{MPR}$ will supply the load from the conditioned line. The battery charger supplies the energy necessary for maintaining a maximum charge to the battery.

#### 3.3.2.2 Inverter stop (DIM)

If the inverter is stopped for any reason, there is no transfer to the conditioned line and the load continues to be supplied by the direct line. The mains voltage and frequency values must be within the tolerance limits specified.

#### 3.3.2.3 Overload (DIM)

In the event of an overload, with a duration in excess of the maximum capacity that is specified for the bypass static switch, the load is maintained on the direct line and a warning message on the LCD display will appear to warn the user about the potential risks related to this condition. This default behaviour can be changed (via a service accessible firmware setting) to force the load to transfer to the conditioned line (similar to that described below) even if the bypass source is available. In the event of an overload in conjunction with an unsuitable bypass mains supply, the 80-NET$_{MPR}$ will transfer the load from the direct line to the conditioned line (assuming that the 80-NET$_{MPR}$ was operating from the direct line) and the inverter will continue to supply the critical load for a period of time that is dependent on the degree of the overload and the UPS features. Visual and audio alarms will alert the user of the problem.

#### 3.3.2.4 Emergency (due to a mains supply failure or a variance beyond tolerance limits, DIM)

If the 80-NET$_{MPR}$ is supplying the load via the direct line and the bypass mains supply varies beyond the tolerance levels (adjustable using the software), the load will be transferred from the direct line to the conditioned line. The load will be powered from the mains via the rectifier and inverter (until the input mains remains within the tolerances stated in technical data table in Chapter 12). Should the input mains fall below the lower limit, the batteries will be used to power the load via the inverter. The user is alerted to the battery discharge by visual and audio alarms and the remaining autonomy is displayed on the LCD. During this process, it is possible to extend the remaining autonomy by switching off non-essential loads.

#### 3.3.2.5 Return to normal conditions (DIM)

When the mains supply returns within the tolerance limits, the 80-NET$_{MPR}$ will continue to supply the load via the conditioned line for a period of time that is dependant on the direct line failure rate (the conditioned line draws power from the mains, not the battery). When the direct line has stabilised the 80-NET$_{MPR}$ returns to normal operation (DIM). As soon as the mains returns the battery charger automatically begins to recharge the battery, so that maximum autonomy is guaranteed in the shortest possible time.

### 3.3.3 Maintenance bypass

If for any reason it is necessary to take the UPS out of service for maintenance or repair, the UPS will be fitted with an internal maintenance bypass switch which enables a load transfer to a bypass supply with no interruption to the critical load. Bypass isolation will be complete and serviceable components such as fuses and power modules etc will be isolated. The transfer/retransfer of the critical load may be accomplished by the automatic synchronisation of the UPS to the bypass supply and by paralleling the inverter with the bypass source, before opening or closing the bypass switch as appropriate.

### 3.3.4 Operation without battery

If the battery is taken out of service for maintenance, it has to be disconnected from the UPS by means of the battery switches provided by the UPS or by the external battery cabinet.
The UPS will continue to operate and meet the performance criteria specified with the exception of the battery backup time.

## 3.4 Control and diagnostics

Control of the power electronics modules will be optimised in order to provide:

- optimum three-phase supply of the load
- minimum line interferences upon the supply network.

By using digital signal processors (DSP) the 80-NET$_{MPR}$ will implement the most advanced digital control.

### 3.4.1 Vector control

To ensure the quick and flexible processing of measuring data, special arithmetic algorithms will be implemented in the DSP, rapidly generating controlled variables as a result.

## 3 Device description

This will thus render possible the real time control of the inverter electronics, resulting in obvious advantages with regards to the performance of the power components. These advantages will be:

- Improvement of short circuit behaviour, as individual phases can be controlled more quickly
- Synchronism or phase angle precision between the UPS output and the bypass supply, even in the case of a distorted mains voltage
- High flexibility in parallel operation: parallel blocks may be housed in separate rooms.

Several algorithms included in the Vector Control firmware are covered by patents owned by Chloride (95 P3875, 95 P3879 and 96 P3198).

#### 3.4.2 Redundancy, preventive monitoring

In order to maximise the reliability of the system, the control unit will monitor a wide number of operating parameters for the rectifier, inverter, charger and battery. All vital operating parameters, such as temperatures, frequency and voltage stability at the system input and output, load parameters and internal system values will be constantly monitored and controlled for irregularities at all times. The system will automatically react before a critical situation arises, either from the UPS or the load, in order to ensure that load is supplied even in these difficult conditions.

#### 3.4.3 Tele-diagnosis and tele-monitoring

In all the above modes of operation, the UPS may be monitored and controlled from a remote location such as a service centre, in order to maintain the reliability of the system at nominal levels. Even during complete shutdown of the UPS, the information relating to the operating parameters will not be lost thanks to a FRAM, which will store the information for up to 45 years.

## 4 General requirements

### 4.1 Applied standards

Chloride operates a Quality Management System which complies with BSI EN ISO 9001-2000 for the design, manufacture, sales, installation, maintenance and service of uninterruptible power supply systems. The Chloride Environmental Policy and Management Systems comply with EN ISO 14 001 and Chloride is committed to implementing a policy of continuous improvement to production processes and pollution reduction. 80-NET$_{MPR}$ will carry the CE mark in accordance with the Safety European Directive 2006/95 (superseding the 73/23 and successive amendments) and European EMC directive 2004/108 (superseding the 89/336, 92/31 and 93/68). 80-NET$_{MPR}$ is designed and manufactured in accordance with the following international standards:

- IEC/EN62040-1-1 general and safety requirements
- EN62040-2 EMC requirements
- IEC/EN62040-3 operating requirements
- Classification according to IEC/EN 62040-3: VFI-SS-111

### 4.2 Safety

In terms of general and safety requirements, the UPS conforms to standard IEC/EN 62040-1-1 governing use in unrestricted access locations.

### 4.3 EMC and surge suppression

Electromagnetic effects will be minimised in order to ensure that computer systems and other similar electronic loads will neither be adversely affected by, nor affect the UPS. The UPS will be designed to meet the requirements of EN 62040-2, class C3. The manufacturer and customer in partnership agree to ensure the essential EMC protection requirements for the specific resulting installation.

### 4.4 Neutral connection and grounding

The 80-NET$_{MPR}$ output neutral will be electrically isolated from the UPS chassis. The input and output neutral connections are the same, i.e. they are solidly tied together. Therefore, the UPS will not modify the state of the upstream neutral, in any operating mode, and the neutral state of the distribution downstream from the UPS is imposed by the mains one. The 80-NET$_{MPR}$ will be used in installations with grounded neutral. Further details please contact Chloride Technical Support.

### 4.5 Materials

All materials and components comprising the UPS will be new and of current manufacture.

## 5 AC/DC Converter (PFC Rectifier + Booster with IGBT)

### 5.1 Primary input

The three-phase current taken from the commercial AC source will be converted to a regulated DC voltage by the rectifier and booster. In particular, the booster will boost the rectifier or battery DC voltage, creating a split of the DC bus, which will allow the inverter to recreate the AC nominal voltage without the need of an inverter transformer. In order to protect the power components within the system, each phase of the rectifier input will all be individually fitted with fast-acting fuses. As shown in Figure 1, the rectifier-booster stage will provide DC power to the IGBT inverter.

### 5.2 Total Input Harmonic Distortion (THD) and Power Factor (PF)

The maximum voltage THD (THDV) permitted on the rectifier input (either from the utility or generator) will be <8%. The maximum current THD injected into the mains (THDi) will all be less than 5% at maximum input power and input voltage THDV <1% (nominal input voltage and current). Under these conditions, the input power factor (PF) will be >0.99. This means that the 80-NET$_{MPR}$ in double conversion mode, will be seen by the primary mains sources and distribution as a resistive load (i.e. it will absorb only active power and the current waveform will be practically sinusoidal), thus ensuring total compatibility with any power source.

### 5.3 Operation with diesel generator

In order to obtain the required THD on the input voltage, the coordination between the diesel generator and UPS will be based on the generator's sub-transient reactance, as opposed to its short-circuit reactance.

## 6 Battery charger

### 6.1 Battery charger

This device will be able to completely recharge the battery bank by delivering DC power to the batteries with a very low voltage and residual current ripple. To recharge the batteries it takes power from the AC input, when the primary input mains is within the given tolerances.

### 6.2 Battery charger mode

This battery charger will be operable with the following types of batteries:

- Sealed Lead Acid (VRLA)
- Lead Acid
- Ni - Cd

The selection of the optimum charging method will be completely managed by the microprocessor. Several different charging methods are available.

### 6.3 Voltage regulation, temperature compensation

In order to ensure optimum battery charging, the float voltage will be automatically adjusted to the ambient temperature. The battery charger is capable of operating within the same tolerances as the rectifier. A further reduction of the input AC voltage (outside specified limits) will inhibit the battery charger and the batteries will be discharged.

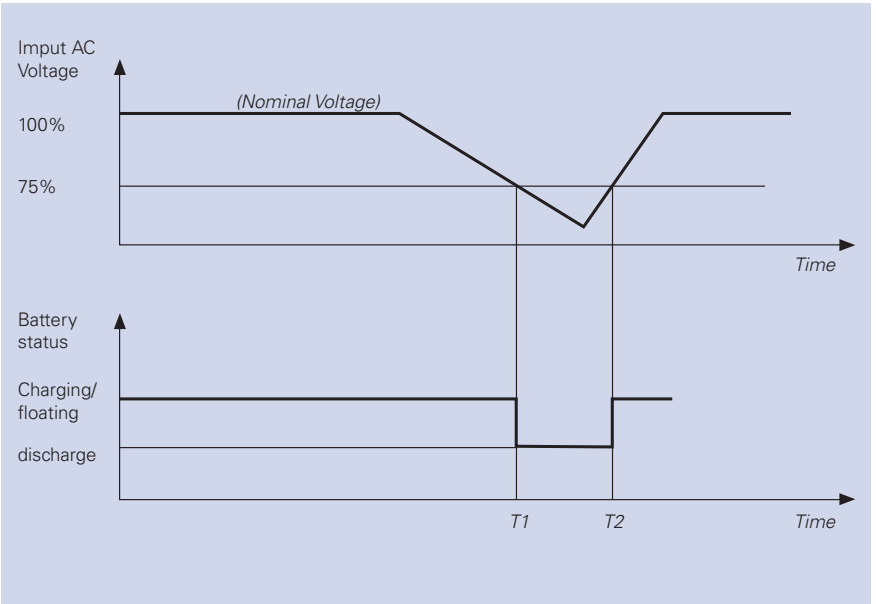


Figure 2. Battery status during reduction of the commercial AC source.

### 6.4 Residual ripple filtering

The battery charger output will have a residual voltage ripple <1% RMS.

### 6.5 Capacity and charging characteristics

When the primary mains is not suitable to supply the rectifier, the DC/DC converter (booster module) will provide the required power to the inverter by using the energy stored in the battery. After the discharge of the battery and when the input AC power is restored, the rectifier will power the inverter. The batteries will be recharged through the battery charger. The following charging methods are an example of the several methods available, giving the possibility of matching the different types of accumulators.

#### 6.5.1 Sealed, maintenance-free lead acid accumulators:

Charging is at constant current up to the maximum floating voltage level. Thereafter, the voltage will be kept at a constant level within narrow limits (single-step charging method).

## 6 Battery charger

6.5.2 Sealed, low-maintenance lead acid accumulators or NiCd accumulators:

Charging is at increased charging voltage and constant charging current (boost charge phase). When the charging current falls short of a lower threshold value, the battery charger will automatically return to the floating voltage level (two-step charging method).

### 6.6 Overvoltage protection

The battery charger will automatically switch off if the DC battery voltage exceeds the maximum value that is associated with its operational status.

### 6.7 Battery management

Using advanced battery care (ABC), the 80-NET$_{MPR}$ series will increase battery life by up to 50%.

6.7.1 Operating parameters

When operating with maintenance free, valve regulated lead acid battery (VRLA), the parameters per cell will be as follows:

- End of discharge voltage (V) 1.65 - 1.75 depending on load
- Shutdown imminent alarm (V) 0.05 over end of discharge voltage
- Minimum battery test voltage (V) 1.85
- Nominal voltage (V) 2.0
- Float voltage (V) 2.27 @ 20°C

6.7.2 Automatic battery test

The operating condition of the batteries will be automatically tested by the control unit at selectable intervals, e.g. weekly, fortnightly or monthly. A short-time discharge of the battery will be made to confirm that all the battery blocks and connected elements are in good working order. In order to preclude a faulty diagnosis, the test will be launched, at the earliest, 24 hours after the latest battery discharge. The battery test will be performed without any risk to the load, even if the battery is completely defective. Users will be alerted of a detected battery fault. The battery test will not cause any degradation in terms of the battery system life expectancy.

6.7.3 Ambient temperature compensated battery charger

The float voltage will be automatically adjusted as a function of the temperature in the battery compartment (3mV/K) in order to maximize battery operating life.

6.7.4 Time compensated end of discharge voltage

When the discharge time exceeds one hour, the shutdown voltage will be automatically increased, as shown in Figure 3 for VRLA, to avoid prolonged battery discharge as a result of a light load.

6.7.5 Remaining battery life

80-NET$_{MPR}$ uses sophisticated algorithms to determine the remaining battery life, based on real operating conditions such as temperature, discharge and charging cycles and discharge depth.

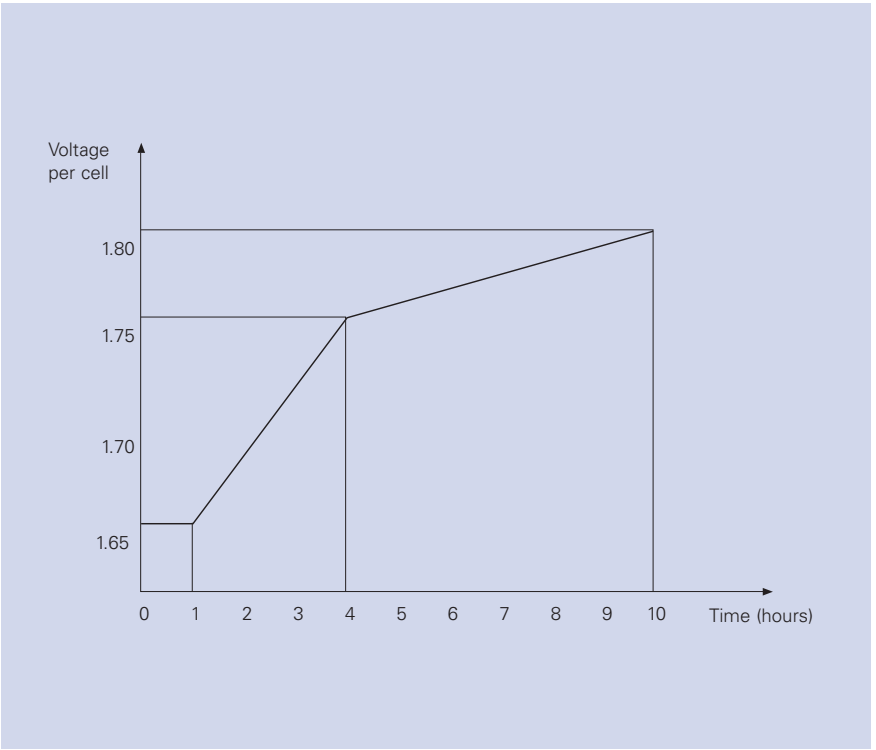


Figure 3. End-of-discharge voltage in relation to discharge time.

## 7 DC/AC IGBT Converter (Inverter)

### 7.1 AC voltage generation

From the DC voltage of the intermediate circuit, the inverter will generate sinusoidal AC voltage for the user load on the basis of pulse-width modulation (PWM). By means of the digital signal processor (DSP) of the control unit, the IGBT of the inverter will be controlled so that the DC voltage is divided up into pulsed voltage packets. Thanks to a low-pass filter, the pulse-width modulated signal will be converted into sinusoidal AC voltage. No isolation transformer is needed for the IGBT inverter, with the great benefits of energy conversion efficiency, physical size and weight of the modules.

### 7.2 Voltage regulation

The inverter output voltage on the three phases will be individually controlled to achieve the following performances:

#### 7.2.1 Steady state

The inverter steady state output voltage will not deviate by more than ±1 % in a steady state condition, for input voltage and load variations within the quoted limits.

#### 7.2.2 Voltage transient response

The inverter transient voltage will not exceed Class 1 (VFI,SS,111) limits when subjected to the application or removal of 100% of the load as defined by IEC/EN62040-3.

### 7.3 Frequency regulation

The inverter output frequency will be controlled to achieve the following performances:

#### 7.3.1 Steady state

The inverter steady-state output frequency, when synchronized to bypass supply, will not deviate by more than ±6 % and is adjustable by ±0.2 to ±6%.

#### 7.3.2 Frequency slew rate

The frequency slew rate will be <1Hz per second.

#### 7.3.3 Frequency control

The inverter's output frequency will be controlled by a quartz oscillator which can operate as a free running unit or as a slave for synchronized operation with a separate AC source. The accuracy of the frequency control will be ±0.1% when free-running.

### 7.4 Total Harmonic Distortion

The inverter will provide harmonic neutralization and filtering to limit the THD on the output voltage to less than 1% with a linear load. For reference, for a non-linear load (as defined by IEC/EN62040-3) the THD will be limited to less than 3%.

### 7.5 Neutral sizing

The sizing of the inverter neutral will be oversized on all ratings in order to cope with the combination of harmonics on the neutral wire when driving single-phase, reference non-linear loads. The inverter neutral is sized x 1.7 in relation to the phase.

### 7.6 Overload

The inverter will be capable of supplying an overload of 125% for ten minutes and 150% for one minute of the nominal power @ 25°C.

### 7.7 Inverter shutdown

In the event of an internal failure, the inverter will be immediately shut down by the control unit. The UPS device or the parallel-operated UPS systems will continue to supply the load from the bypass, without interruption, if it is within permissible limits.

### 7.8 Output voltage symmetry

The inverter will guarantee the symmetry of the output voltages at ±1 % for balanced loads and for 100% unbalanced loads.

### 7.9 Phase displacement

The phase angle displacement between the three-phase voltages will be 120° <±1 [°el] for balanced loads and for unbalanced loads (0, 0, 100%)

### 7.10 Short circuit

The inverter short circuit capacity of the 80-NET*MPR*, for the first 10ms, will be >300% for any short circuit configuration. After the first 10ms, it will limit the current to =150% for no longer than 5s and then it will shut down.

### 7.11 Automatic upgrade of inverter rated power

The inverter will automatically upgrade its power as a function of ambient and operating temperatures, as shown in Figure 4. In the most common conditions (25°C) the 80-NET*MPR* will provide 10% more power than nominal.

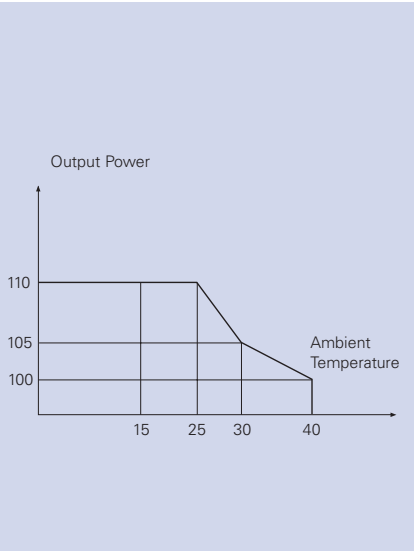


Figure 4. Automatic power upgrade.

## 7 DC/AC IGBT Converter (Inverter)

### 7.12 Symmetrical Power Factor Output Diagram

The full IGBT inverter is able to supply, without derating, all kinds of loads with a power factor up to 0.9 leading and lagging. This behavior is achieved thanks to the perfect dimensioning of all components of the output stage, which allows the obtaining of a Power Factor output diagram perfectly symmetrical respect to the zero. Thanks to this feature, which is unique in the market, the 80-NET$_{MPR}$ offers maximum flexibility and compatibility with each installation and means that the customer doesn't have to worry about future modifications of the loads with a different Power Factor. As it is shown in figure 5, it is clearly evident from the blue area that every kind of load (leading or lagging) with PF up to 0.9 will be supplied by the UPS without any derating since the inverter will be able to work at 100% of its power.

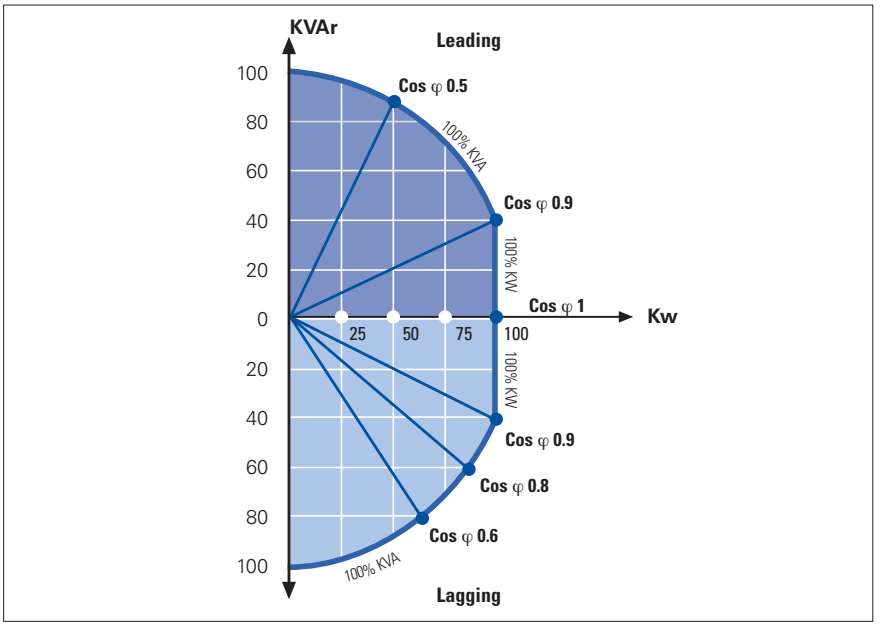


Figure 5. Power Factor Output Diagram.

## 8 Electronic static switch (Bypass)

### 8.1 General

The bypass static switch will be a fully rated, high speed, solid-state transfer device and rated for continuous duty operation.

The following transfer and retransfer operations will be provided by the electronic static switch:

- Uninterrupted automatic transfer to the bypass supply in the event of:
  - inverter output overload
  - battery voltage outside limits in backup mode
  - over-temperature
  - inverter failure
- If the inverter and the bypass supply are not synchronised in the moment of a necessary transfer, a switching delay can be set to protect the critical load. This prevents any possible damage to the load by an unintentional phase shift.
- Uninterrupted manual transfer/retransfer to and from the bypass supply will be initiated from the control panel.
- Uninterrupted automatic transfer/ retransfer to and from the bypass supply by activation of the digital interactive mode
- Uninterrupted automatic retransfer from the bypass supply, as soon as the inverter regains the capacity to supply the load in the case of Double conversion priority
- The uninterrupted transfer from the inverter to the bypass supply will be inhibited in the following situations:
  - bypass supply voltage outside limits
  - failure of electronic bypass switch
  - frequency converter configuration
- The uninterrupted automatic retransfer from the bypass to inverter may be inhibited in the following situations:
  - manual switching to bypass supply via the maintenance switch
  - UPS output overload.
  - inverter fault

#### 8.1.1 Voltage

The nominal voltage of the bypass line will be 230/400 VRMS. Any transfer from the inverter to the bypass line will be inhibited if the voltage is beyond a limit of ±10% (standard setting) of the nominal voltage.

#### 8.1.2 Transfer time (double conversion)

The switching time for a transfer from the inverter to the bypass supply or vice versa, will be less than 0.5ms when synchronized. The system will ensure that the inverter is stable and operating normally before permitting the load to retransfer to the inverter. The transfer time when out of synchronization will be 20 milliseconds in order to prevent load damage by phase reversal.

#### 8.1.3 Overload

The bypass static switch will be capable of supporting the following overloads:
10 minutes = 125%; 1 minute = 150%

## 8 Electronic Static Switch (Bypass)

### 8.1.4 Manual maintenance bypass

The 80-NET*MPR* is equipped with a manual maintenance bypass it will be possible to implement a manual uninterrupted bypass (MBS) of the complete system so that maintenance work can be carried out on the system. The bypass supply will continue to feed the load. After following the maintenance procedure, the UPS will be voltage-free as it will be disconnected from the supply networks. In this case, maintenance work on the UPS can be carried out without affecting the connected electric load.

### 8.2 Backfeed protection

When the UPS bypass input line is powered off, there is normally no dangerous voltage/current/power present on the UPS bypass input. However, when there is a fault (short-circuit) there is the risk that electric power appears on the UPS bypass input terminals. In this case the inverter powers the critical load and the upstream input power line. This unexpected dangerous power can propagate in the upstream distribution through the faulty bypass line. Backfeed protection is a safety device which prevents any potential risk from electric shock on the UPS bypass input AC terminals, in the event of a failure of the bypass static switch SCR.

The control circuit will include a contact (available for the user) which activates an external isolating device, such as an electromechanical relay or a tripping coil, upon backfeed detection. In compliance with IEC/EN 62040-1-1, the external isolating device is not included in the UPS. The external isolating device will be a 4 pole (3 phases plus neutral) air gap isolator and will be defined according to clause 5.1.4 of the previously cited standard.

## 9 Monitoring and control, interfaces

### 9.1 General

The UPS will incorporate the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, and to take action where appropriate. Furthermore, interfaces allowing extended monitoring and control, in addition to service functions, will be available.

### 9.2 Mimic panel

The control panel of the 80-NET*MPR* includes a back-lit Liquid Crystal Display (LCD of eight lines x 12 characters, displaying graphic diagrams and symbols) for complete UPS monitoring and control. Complete access to all LCD menus is possible through navigation push buttons located below the screen.

This navigation group includes two buttons - "up" and "down" - for menu scrolling and two software-assigned push buttons: the function linked to these two buttons is displayed on the lower right and lower left corners of the LCD during navigation. A single-line diagram of the UPS is continuously displayed on the default page (for reference see figure 1). The main functional blocks and power paths of the UPS are displayed using simple universal technical symbols, instantly communicating the overall status of the UPS. The same screen also permanently displays the output load percentage measurement, using three histograms (one for each output phase). In the case of the UPS not being in normal functioning mode, it is possible to access the "Warning and Alarm" summary page directly from the default page. Warnings and alarms will be identified by text strings and codes. In battery operation, the display will switch between warning codes and the estimated backup time which is displayed in minutes.

After 30 seconds of inactivity (i.e. without buttons being pressed) the display reverts to the default page.

The text displayed by the LCD will be available in 15 languages: English, Italian, French, German, Spanish, Portuguese, Turkish, Polish, Swedish, Norwegian, Finnish, Czech, Russian, Arabic, Chinese, all selectable by the user.

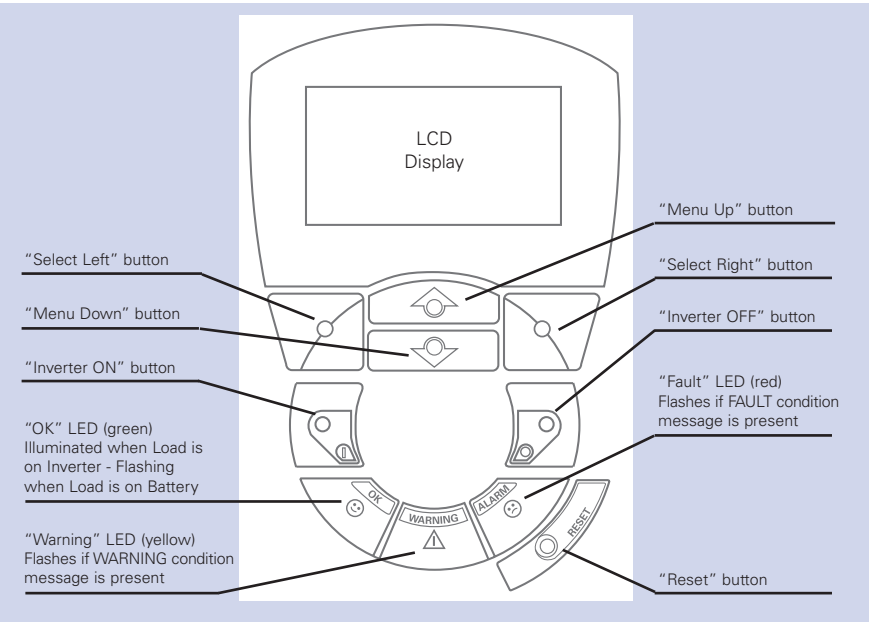


Figure 6. Control panel and LCD.

## 9 Monitoring and control, interfaces

### 9.3 Start and Stop inverter push buttons

The Start and Stop push buttons are integrated into the mimic panel board, and have the following predefined functions:

| | |
|---|---|
| | Start inverter operation |
| | Stop inverter operation |

The control will incorporate a safety feature to prevent inadvertent operation whilst still allowing rapid shutdown in the event of an emergency. To stop the inverter the user must press and hold the Stop button for two seconds. An audio alarm will be activated during this delay time.

### 9.4 General Status LED

Three LED indicators will render it possible to obtain a quick and general understanding of the status of the UPS, as described below:

| | |
|---|---|
| **OK** LED (green) | **Normal Operation**<br>When this light is on (not flashing), the system is running normally and neither warnings nor alarms are present. During mains failures (all other conditions being at nominal level), this LED will flash. |
| **Warning** LED (yellow) | **Warning Condition(s) present**<br>This indication will be activated by the presence of anomalous conditions, which could affect the nominal functioning of the UPS. These conditions are not originated from the UPS, but may be caused either by the surrounding environment or by the electrical installation (mains side and load side). It will be possible to read the description of the active warning(s) by browsing the relevant LCD display menus. |
| **Alarm** LED (red) | **Alarm Condition**<br>When this light is on, immediate attention should be given to the severity of the alarm and service should be called promptly. It will be possible to read the description of the active alarm(s) by browsing the relevant LCD display menus. |

### 9.5 LCD display menus description

By using the appropriate push buttons it will be possible to browse the following menus:

**PFC Rectifier and Booster with IGBT**
This menu will display rectifier status, booster status, alarms, DC voltage and total DC current.

**IGBT Inverter**
This menu will display inverter status and alarms.

**Bypass Supply**
This menu will display alarms, phase to neutral voltages and frequency measurements.

**Battery Charger**
This menu will display the Battery Charger status and alarms.

**Load/Bypass Static Switch**
This menu will display status, alarms, current per phase, frequency measurements, load percentage per phase, active and apparent powers.

**Battery**
This menu will display battery status, alarms, voltage, battery current with polarity, battery temperature and battery capacity. When the output inverter is supplied by the battery, the module will display the remaining autonomy time. A change in the load will cause the autonomy indicator to display the new autonomy time.

For a complete list of the messages and menu descriptions, please refer to the 80-NET*MPR* User Manual.

### 9.6 Interface

#### 9.6.1 Slot card bay (XS3 & XS6)

The 80-NET*MPR* will be equipped with two slot bays, available for communication card options. One of the slots (XS6) will be available for the LIFE.net slot modem. The other slot (XS3) will be available for connectivity options, such as ManageUPS NET III adapter. Please refer to Chloride Connectivity Solutions for further details about the available slot expansion cards.

## 9 Monitoring and control, interfaces

### 9.6.2 RS232 Service port (X3)

The 80-NET*MPR* will be equipped with one D type female connector with 9 pins for serial RS232 communication. Its purpose is for service and commissioning only.

The connector has the following pin functions:

| PIN | Signal | Explanation |
|---|---|---|
| PIN 2 | RS232 TxD | Send RS232 |
| PIN 3 | RS232 RxD | Receive RS232 |
| PIN 5 | GND | Signal ground RS232 |

The Interface is SELV - isolated from UPS primary circuits.

### 9.6.3 LIFE.net (X6)

The service Interface is a SUB-D 9 pin male connector for RS232 serial communication.

The 80-NET*MPR* has the slot (XS6) available for the LIFE.net slot modem. If this slot modem is not installed, this port may be used for an external LIFE.net kit (e.g. LIFE over IP, GSM).

| PIN | Signal | Explanation |
|---|---|---|
| PIN 2 | RS232 RxD | Receive RS232 |
| PIN 3 | RS232 TxD | Send RS232 |
| PIN 5 | GND | Signal ground RS232 |

The Interface is SELV - isolated from UPS primary circuits.

### 9.7 2*16 Pole screw connector for input and output contacts (TB1)

This 2*16-pole screw connector allows the connection of: 6 individual configurable output and 4 individual configurable input contacts which can be programmed via PPVis (service software tool) for a wide set of functions. This interface is SELV-isolated from the UPS primary circuits. The maximum rating of the output contacts must not exceed 24V and 1A (refer to the User Manual for further details).

Output Contacts (lower row of the connector):

| PIN | Status | Preset Value |
|---|---|---|
| PIN 1 (left) | Normally closed | Summary Alarm |
| PIN 2 | Normally open | |
| PIN 3 | Normally closed | Bypass Active |
| PIN 4 | Normally open | |
| PIN 5 | Normally closed | Low Battery |
| PIN 6 | Normally open | |
| PIN 7 | Normally closed | AC Fail |
| PIN 8 | Normally open | |
| PIN 9 | Common to PIN1-PIN8 | N/A |
| PIN 10 | N/A | N/A |
| PIN 11 | Normally closed | Selectable |
| PIN 12 | Normally open | |
| PIN 13 | Common to PIN11-PIN12 | N/A |
| PIN 14 | Normally closed | Selectable |
| PIN 15 | Normally open | |
| PIN 16 | Common to PIN14-PIN15 | N/A |

## 9 Monitoring and control, interfaces

Input Contacts (upper row of the connector):

| PIN | Status | Preset Value |
|---|---|---|
| PIN 1 (left) | Input 1 (24VDC OUT) | Selectable |
| PIN 2 | Input 1 (24VDC signal) | |
| PIN 3 | Input 2 (24VDC OUT) | Selectable |
| PIN 4 | Input 2 (24VDC signal) | |
| PIN 5 | Input 3 (24VDC OUT) | Selectable |
| PIN 6 | Input 3 (24VDC signal) | |
| PIN 7 | Input 4 (24VDC OUT) | Selectable |
| PIN 8 | Input 4 (24VDC signal) | |
| PIN 9 - 16 | N/A | N/A |

The Interface is SELV - isolated from UPS primary circuits.

### 9.8 LIFE.net

In order to increase the overall reliability of the system, 80-NET*MPR* will be fully compatible with the LIFE.net communication kit, providing connection to Chloride's LIFE.net remote diagnostic service. LIFE.net will allow the remote monitoring of the UPS through IP connection, telephone lines or GSM link in order to ensure maximum reliability of the UPS throughout its operational life. The monitoring will be a real 24-hour, 365 day service thanks to a unique feature that allows trained Service Engineers to remain in constant electronic contact with the service centre, and therefore the UPS. The UPS will automatically dial up the service centre at defined intervals to provide detailed information that will be analyzed in order to predict near term problems. In addition, it will be possible to control the UPS remotely.

The service centre will analyze historical data and issue a regular detailed report to the customer informing him of the UPS operational condition and any critical states.
The LIFE.net centre allows the possibility of activating the LIFE-SMS delivery system option, where the customer can receive SMS notification in case one of the following events occurs:

- Mains power failure
- Mains power recovery
- Bypass line failure
- Load supplied by reserve.

The communication of UPS data to the Chloride LIFE Command Centre will be transmitted at the following intervals:

- ROUTINE: settable at intervals of between five minutes and two days (typically once a day)
- EMERGENCY: when a problem occurs or parameters are beyond tolerance limits
- MANUAL: following a request from the customer (user)

During the call the command centre will:

- Identify the UPS connected
- Request the data stored in the UPS memory since the last connection
- Request real-time information from the UPS (selectable)

## 10 Mechanical data

### 10.1 Enclosure

The UPS will be housed in a space-saving modular enclosure, with hinged front door and removable panels (protection as standard to IP 21). The enclosure will be made of zintec coated sheet steel and the door will be lock-able.

### 10.2 Ventilation

Forced redundant air cooling will ensure that all the components are operated within their specification. The UPS will also be capable of preserving normal operations, even with one cooling fan stopped (due to a failure) with 70% of the output nominal load @ 25°C ambient temperature.
In the event where, the converters have over heated and the above conditions are not met (one fan failed), the UPS will supply the load through the static bypass. The cooling air entry will be at the front and the air exit at the back of the device; clearance required at the rear of the unit should be at least 100mm for ventilation reasons.

### 10.3 Cable entry

Cable entry will be from the bottom (rear) of the cabinet.

### 10.4 Enclosure design

All surfaces of the enclosure will be finished with an electrostatically applied epoxy coat. The standard colour of the enclosure will be RAL 7016.

### 10.5 Access to integrated subassemblies

All internal subassemblies for typical and most frequent maintenance, will be accessible from the front of the unit via hinged doors or from the top. The UPS has casters and therefore can be moved.

## 11 Environmental conditions

The UPS will be capable of following withstanding any combination of the following environmental conditions.
It will operate without mechanical or electrical damage or degradation of the operating characteristics.

### 11.1 Ambient temperature

| | |
|---|---|
| Operating temperature: | 0° to 40°C |
| Maximum average daily temperature: | (24 hr) 35°C |
| Maximum temperature: | (8 hr) 40°C |

### 11.2 Relative humidity

Up to 90% (non condensing) for a temperature of 20°C.

### 11.3 Altitude

The maximum altitude without de-rating will be 1000 meters above sea level (for higher altitudes 80-NET*MPR* complies with IEC/EN 62040-3).

## 12 Technical data (30 to 40 kVA)

| UPS Unit | | 30 kVA | 40 kVA |
|---|---|---|---|
| **12.1 Primary input** | | | |
| Nominal voltage[1] | (V) | 400 (3Ph + N[1]) | |
| Voltage range | (V) | 300 to 460 (-25% + 15%) | |
| Nominal frequency | (Hz) | 50 (60 selectable) | |
| Frequency range | (Hz) | ±10% | |
| Maximum input current @ ambient temperature within the range 0°C to 40°C | (A) | 56 | 75 |
| Power factor @ nominal load and nominal input conditions[2] | | >0.99 | |
| Input current distortion @ nominal input conditions[2] [3] and nominal output power: Minimum / Typical | (%) | <3/<5 | |
| Inrush current / Imax input[4] | | <1 | |
| **12.2 Battery** | | | |
| Recommended no. of cells: | - VRLA<br>- WET<br>- NiCd[5] | 192<br>192<br>300 | |
| Float voltage for VRLA @ 20°C[6] | (V/cell) | 2.27 | |
| End cell voltage for VRLA | (V/cell) | 1.65 - 1.75 depending on the load (see chapter 6) | |
| Float voltage temperature compensation | | -3mV cell/K | |
| DC ripple current in float mode for a 10 min autonomy as per VDE0510[5] | | 1% rms | |
| Float Voltage stability in steady state condition | (%) | <1 | |
| Optimum battery temperature | (°C) | 15 to 25 | |
| Battery recharge current setting range | (A) | 0-10 | |
| Battery output power in discharge mode with nominal output load | (kW) | 29.6 | 39.6 |
| End battery voltage for 192 cells | (V) | 307 to 336 depending on the load (see chapter 6) | |
| End battery current for 192 cells with nominal load | (A) | 98 | 131 |

## 12 Technical data (30 to 40 kVA)

| **UPS Unit** | | **30 kVA** | **40 kVA** |
|---|---|---|---|
| **12.3 Inverter output** | | | |
| Nominal apparent power @40°C ambient | (kVA) | 30 | 40 |
| Nominal active power | (kW) | 27 | 36 |
| Nominal output current | (A) | 43.5 | 58 |
| Overload at nominal output voltage for 10 minutes | (%) | 125 | |
| Overload at nominal output voltage for 1 minute | (%) | 150 | |
| Short circuit current for 10ms/<5sec | (%) | 300/150 | |
| Nominal output voltage | (V) | 400 (380/415 selectable, 3Ph+N) | |
| Nominal output frequency | (Hz) | 50 (60 selectable) | |
| Voltage stability in steady state condition for input variations (AC & DC) and step load (0 to 100%) | (%) | <1 | |
| Voltage stability in dynamic condition for input variation (AC & DC) and step load (0 to 100% and vice versa) | (%) | Complies with IEC/EN 62040-3, Class 1 (VFI, SS, 111) | |
| Voltage stability in steady state for 100% load imbalance (0, 0, 100) | (%) | <1 | |
| Output frequency stability: | | | |
| - synchronised with bypass mains | (%) | ±1 (adjustable between ±0.2 to ±6) | |
| - synchronized with internal clock | (%) | ±0.1 | |
| Frequency slew rate | (Hz/sec) | <1 | |
| Output voltage distortion with 100% linear load | (%) | <1 | |
| Output voltage distortion @ reference non linear load as for I EC/EN 62040-3 | (%) | <3 | |
| Load crest factor handled without derating the UPS | (Ipk/Irms) | 3:1 | |
| Phase angle precision with balanced loads | (degrees) | <1 | |
| Phase angle precision with 100% unbalanced loads | (degrees) | <1 | |
| Neutral conductor sizing | | 1.7 nominal current | |
| Output power upgrading with ambient temperature: | | | |
| At 25°C | (%) | 110 | |
| At 30°C | (%) | 105 | |
| At 40°C | (%) | 100 | |

## 12 Technical data (30 to 40 kVA)

| UPS Unit | | | 30 kVA | 40 kVA |
|---|---|---|---|---|
| **12.4 Static bypass** | | | | |
| Nominal bypass voltage[1] | | (V) | 400 (380/415 selectable, 3ph+N) | |
| Nominal frequency | | (Hz) | 50/60 (selectable) | |
| Frequency range | | (%) | ±6 (adjustable between ±0.2 to ±6) | |
| Voltage range | | (%) | ±10 (adjustable ± 5 to ± 15%) | |
| Maximum overload capacity: | For 10 minutes<br>For 1 minute | (%)<br>(%) | 125<br>150 | |
| Transfer time with inverter synchronous to bypass:<br>Inverter to Bypass and Bypass to Inverter | | | no break | |
| Transfer time with inverter not synchronous to Bypass | | (ms) | ≥20 (adjustable) | |
| **12.5 System data** | | | | |
| AC/AC efficiency without charging current @ nominal input conditions[2] with resistive load: | 25% load[7]<br>50% load[7]<br>75% load[7]<br>100% load[7]<br>Digital interactive[7] | (%)<br>(%)<br>(%)<br>(%)<br>(%) | 90.5<br>93<br>93<br>92.5<br>98 | 92.5<br>93.5<br>93.5<br>93<br>98 |
| Heat dissipation | 100% load<br>75% load<br>50% load<br>25% load<br>Power loss | (kW)<br>(kW)<br>(kW)<br>(kW)<br>(kW) | 2.19<br>1.5<br>1<br>0.7<br>0.5 | 2.7<br>1.9<br>1.2<br>0.7<br>0.5 |
| Noise level @ 1 meter | | (dBA ± 2dBA) | 50 | |
| Protection degree: | With open doors<br>With closed doors | | IP20<br>IP21 | |
| Mechanical dimensions: | Height<br>Width<br>Depth | (mm)<br>(mm)<br>(mm) | 1600<br>550<br>800 | |
| No. of cabinets | | | 1 | |
| Frame colour | | (RAL scale) | RAL 7016 | |
| Weight | Without battery<br>With battery | (kg)<br>(kg) | 184<br>501 | 187<br>504 |
| Floor area | | (m2) | 0.44 | |
| Floor loading without battery | | (kg/m2) | 414 | 425 |

## 12 Technical data (30 to 40 kVA)

| **UPS Unit** | | **30 kVA** | **40 kVA** |
|---|---|---|---|
| Cable entry | | Bottom (rear) | |
| Access | | Front / Top | |
| Cooling[8] | | Forced Ventilation with redundancy | |
| **12.6 Environmental** | | | |
| Temperature: Operating<br>Max Average daily (24hrs) | (°C)<br>(°C) | 0-40<br>35 | |
| Maximum relative humidity @ 20°C (non condensing) | (%) | up to 90 | |
| Max altitude above sea level without de-rating | (m) | 1000 (for higher altitudes complies with IEC/EN 62040-3) | |

(1) In case of a split input configuration, the primary input and the bypass input must have a common neutral. The neutral conductor could be connected only to the bypass or primary mains but it must be present (bypass and primary neutrals are solidly connected within the UPS).
(2) At nominal voltage and nominal frequency.
(3) With input voltage at nominal value and with voltage distortion THDv <1%.
(4) "Imax input" parameter can be calculated using the maximum input power @ 400V in battery recharge mode.
(5) Special battery cabinets needed for more than 192 cells.
(6) There are several possible charging methods. See chapter 6 for details.
(7) For tolerances see IEC/EN 60146-1-1 or DIN VDE 0558.
(8) Redundant cooling system. With one fan OFF the UPS can supply continuously 70% of the nominal output power in typical conditions.

General conditions for the Technical Data table:
The data shown is typical and not definable in other ways; furthermore the data refers to a 25°C ambient temperature and where not specified, with PF=1.

Not all the data shown applies simultaneously and may be changed without prior warning.
Data applies to the standard version, if not otherwise specified.
If the options described in chapter 13 are added, the data shown in the Technical Data Table may vary.
For test conditions and measurement tolerances not specified refer to the Witness Test Report procedure.

## 13 Options

Where options described in this chapter are added to the UPS, the data presented in the standard technical data tables may vary. Some options may not be available contemporarily on the same UPS.

### 13.1 Parallel configurations

The 80-NET$_{MPR}$ can be connected in up to 8 units in parallel, without the need for an additional parallel board, allowing maximum reliability and flexibility. A single unit can be upgraded to a parallel one at any time through a licence code which is univocally related to the UPS and allows the service engineer to configure the full set of parallel parameters.
See chapter 14.

### 13.2 Remote alarm unit

A remote alarm panel will be available to display important individual messages from the UPS. Upon request, it will be possible to display up to four UPS systems. The length of the connecting cable must not exceed 300m.

### 13.3 External battery circuit breaker

This option will include a fully rated circuit breaker and an additional auxiliary contact for monitoring its position by the UPS (via a dedicated input contact). The circuit breaker will be housed in a wall-mounted box and designed for battery systems which are mounted on racks. Furthermore, the circuit breaker will serve as a safety element for the cross section of the power cable between the UPS and the remotely placed battery system.

### 13.4 Battery management modules (only upon request)

With measuring modules connected to the battery blocks, enhanced battery management will be possible offering the following features:

- Measurement of the condition of each individual battery block by means of separate battery measuring modules (BMM)
- Analysis of each battery block with measurement of the minimum and maximum voltage values

### 13.5 Dust filters

With this option, dust filters will be mounted in front of the drawers that are inside the UPS in order to increase the level of protection against entry of dust.

### 13.6 Empty battery cubicle

Matching empty battery cubicles will be available including:

- Cubicle
- Disconnecting device
- Fuses
- Safety screen
- Connection terminals
- UPS/battery connection cables (for adjacent installations)

One cubicle size will be available:

| Type | Width (mm) | Depth (mm) | Height (mm) | Weight (kg) |
|---|---|---|---|---|
| A1 | 550 | 800 | 1600 | 100 |

### 13.7 Empty options cubicle

A matching cubicle will be available for customized applications such as:

- Customised distribution boards
- Customised applications

### 13.8 Use as frequency converter

80-NET$_{MPR}$ may be programmed for use as a frequency converter (50Hz in -60Hz out or 60Hz in -50Hz out) for operations with or without a battery bank connected.
In this operational mode, the data shown in the Technical Data table may vary (e.g. output overload capability). Please contact Chloride Technical Support for details.

### 13.9 Telephone switch for LIFE.net

The installation of the telephone switch for LIFE.net will allow the user to use a telephone line normally reserved for other purposes (e.g. fax or telephone).

### 13.10 ManageUPS NET adapter

This option will include a complete package to ensure monitoring and control of the networked UPS through TCP/IP protocol. The adapter permits:

- UPS monitoring from NMS via SNMP
- UPS monitoring from PC via a Web browser
- Dispatch of e-mail messages on occurrence of events

ManageUPS, in conjunction with MopUPS, will also permit the safe shutdown of operating systems.

### 13.11 MopUPS shutdown and monitoring software

The main function of MopUPS software will be the safe shutdown of the operating system in the event of a power failure. Other functions include:

1. Automatic communications of events; e-mail, SMS, etc
2. Saving event log and status information to file
3. Viewing and monitoring of the UPS in real time
4. Programmed system shutdown Mop UPS shutdown and monitoring software will communicate with the 80-NET$_{MPR}$ via the ManageUPS NET adapter.

## 13 Options

### 13.12 MODBUS RTU / JBUS and Environment Sensor

Two special version of the ManageUPS NET adapter are available for the 80-NET*MPR* and include the following added options:

- The ManageUPS NET Adapter + B series provides an open approach to the management of the networkpower. ManageUPS + B simplify the integration of CHLORIDE UPS systems with Building Monitoring and Automation Systems via MODBUS RTU, MODBUS/TCP or JBUS protocols.

- ManageUPS NET Adapter + E provide an open approach to the management of network power. ManageUPS delivers a complete set of manageability options including SNMP, WEB, Telnet, data login, event logging and the shutting down of multiple servers via TCPIP network connection. Event messages are offered as email as well as SNMP Traps - a truly versatile tool for managing UPS systems in a network environment.

## 14 Parallel configuration

### 14.1 Paralleling principle

The 80-NET*MPR* series of uninterruptible power supply systems will be connectable in parallel for multi-module configurations between units of the same rating. The special version T and LAM (see chapter 15) can also be connected in parallel but only units of the same ratings and same special version. The maximum number of UPS in a parallel configuration is eight. The UPS parallel connection will increase reliability and power.

**Reliability**

If the installation requires more than one unit in a redundant configuration, the power of each UPS should not be lower than Ptot/(N-1), where:

Ptot = Total load power
N = Number of UPS units in parallel
1 = Minimum coefficient of redundancy

Under normal operating conditions, the power delivered to the load will be shared between the number of UPS units connected to the parallel bus. In the case of an overload the configuration may deliver Pov x N without transferring the load onto the reserve, where:

Pov = Max overload power of a single UPS
N = Number of UPS units in parallel

In the event of failure in one of the UPS units, the faulty unit will be disconnected from the parallel bus and the load will be supplied from the remaining units without any break in the supply's continuity.

**Power**

It will be possible to increase the power of the system by using a non-redundant parallel configuration (redundancy coefficient = 0). In this case an optional SBS is required for maintenance or replacing of one unit.

In this configuration all connected UPS units will deliver the rated power and in the event of a unit failure or overload, the system will transfer the load to the reserve. A maximum of eight UPS may be connected in parallel.

**Performance features**

The performance features of the parallel system are related to the UPS systems employed. The distribution of the load is divided equally between the individual UPS systems.

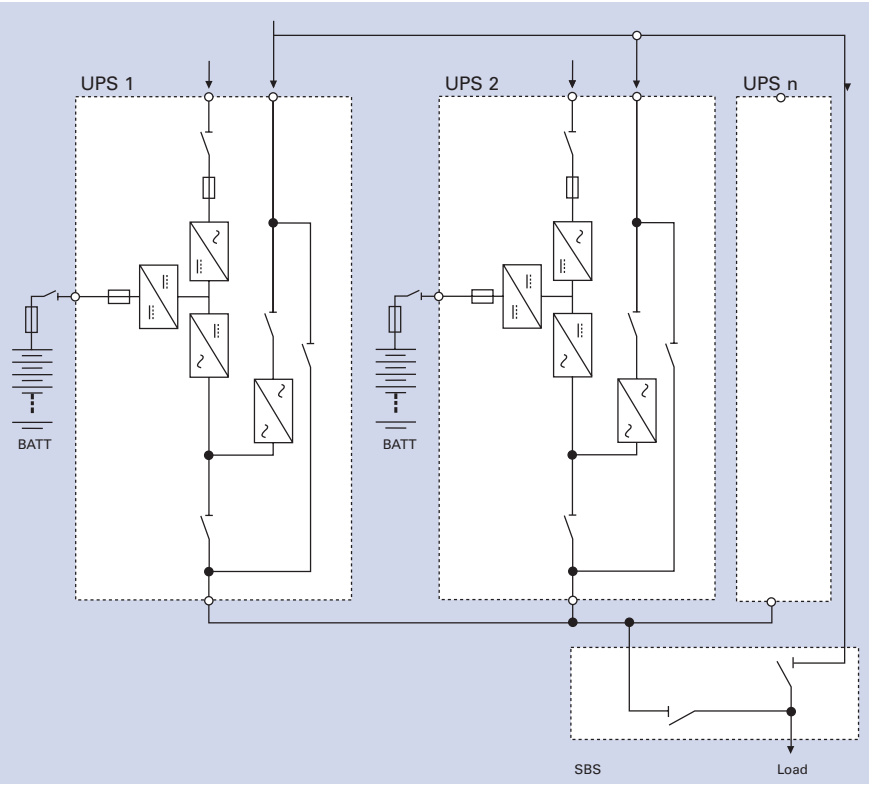


Figure 7. Modular Parallel System +SBS.

## 14 Parallel Configuration

### 14.2 Modular

80NET*MPR* series' UPS systems will be capable of operating in a parallel modular configuration. For this purpose UPS systems of the same rating will be connected in parallel to form multi-module configurations. The parallel connection of the UPS will either improve reliability, the total output power, or both. The 80-NET*MPR* is able to connect up to 8 units in parallel, without the need for an additional parallel board, allowing maximum reliability and flexibility.
A single unit, at any time, can be upgraded to a parallel one through a licence code which is univocally related to the UPS and allows the service engineer to configure the full set of parallel parameters. The parallel option will simply consist of screened data cables connected to the neighbouring UPS modules (closed loop ring bus). A multi-module system will be controlled and monitored automatically by controlling the individual UPS systems. The parallel system control is distributed among the units (no master/slave architecture). The bypass lines and inverters included in each UPS share the load. The load sharing among the UPS parallel system ("load on inverter" mode) will be achieved with a tolerance of less than 5% at any system load fraction (0 - 100%). The loop ring bus will allow the parallel to share the system load even with an interruption in the data cable (first failure proof system).

### 14.3 System Bypass Switches (SBS)

A system bypass switch will be available as an option for the modular parallel configuration. This will include two power disconnect switches. The SBS is mandatory when a modular parallel system is being installed and no redundancy is present. The rating available will be: (Special SBS are needed for galvanically isolated special versions T and LAM (see chapter 15):

| | Height (mm) | Width (mm) | Depth (mm) | Weight (kg) |
|---|---|---|---|---|
| 400 A | 1780 | 620 | 858 | 300 |

## 15. Special version

The 80-NET$_{MPR}$ can be customized to provide full galvanic isolation and voltage adaption for specific load requirements. The following versions are available upon order:

### 15.1 T-version

The 80-NET$_{MPR}$-T includes an isolation transformer at the input. This transformer is installed in place of the batteries and provides complete electrical isolation between the load and the input mains utility.

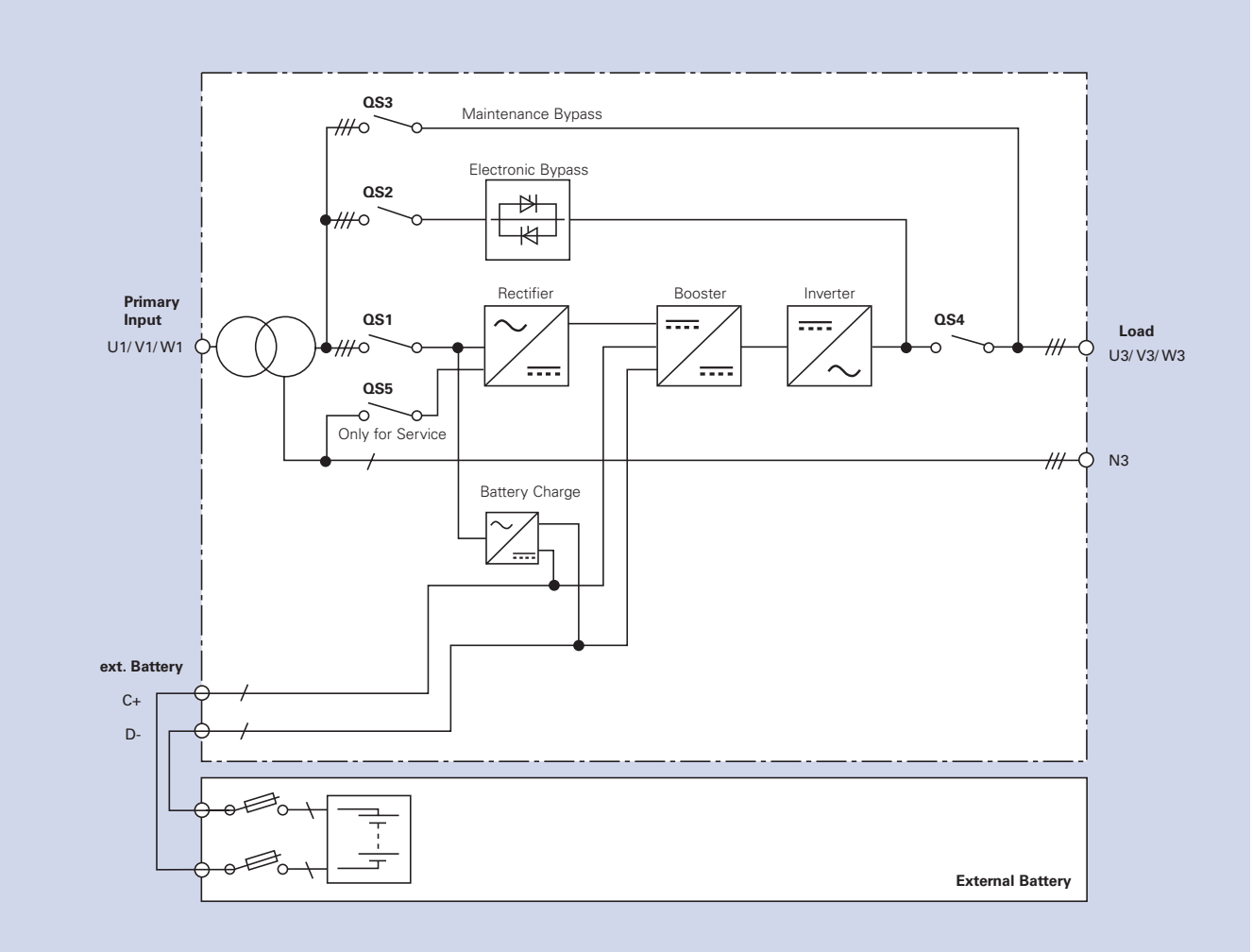


Figure 8. 80-NET$_{MPR}$ T-version single line diagram.

## 15. Special version

The technical data differs accordingly as indicated in the following table:

| **DESCRIPTION** | | **Unit** | **UPS power rating** | |
|---|---|---|---|---|
| T - version | | kVA | 30 | 40 |
| **Electrical data** | | | | |
| **INPUT** | Voltage | Vrms | 400V, 3Ø (+N), + 15%, -25% | |
| | Current (single phase) | Arms | 42 | 68 |
| | Frequency | Hz | 50/60 Hz auto selection | |
| **OUTPUT** | Power rating | kVA | 30 | 40 |
| | | kW | 27 | 36 |
| | Voltage | Vrms | 380V, 400V, 415V, 3Ø+N | |
| | Current @ 400 Vrms | Arms | 43 | 58 |
| | Frequency | Hz | 50/60 Hz auto selection | |
| | Wave form | - | Sinusoidal | |
| Max dissipation (@ nominal load and battery in recharge) | | W | 3050 | 4850 |
| **Mechanical data** | | | | |
| Depth | | mm | 800 | |
| Width | | mm | 550 | |
| Height | | mm | 1600 | |
| Weight | | kg | 380 | 480 |
| Max. noise level (@ 1m) | | dBA | <58 | |

## 15. Special version

### 15.2 LAM-version

The 80-NET$_{MPR}$ - LAM includes two internal transformers for isolation and voltage adaptation from 400V to 208/220V phase to phase. These transformers are installed in place of the batteries: the one installed at the input (isolation transformer) provides full electrical isolation and voltage adaptation (208/220 primary, 400V secondary) and the one at the output (auto-transformer) allows voltage adaptation (400V primary, 208/220V secondary).

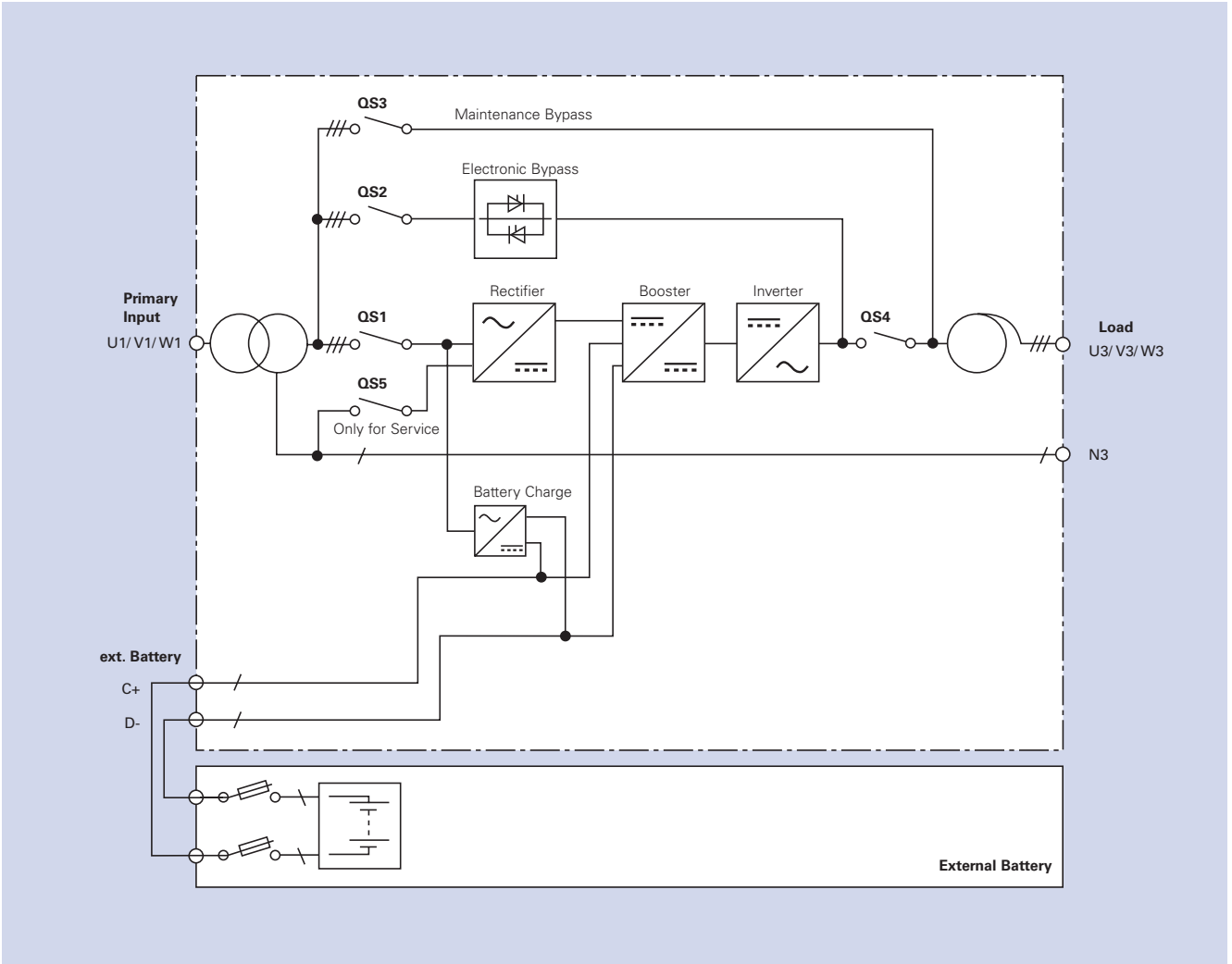


Figure 9. 80-NET$_{MPR}$ LAM-version single line diagram.

## 15. Special version

The technical data differs accordingly as indicated in the following table:

| **DESCRIPTION** | | **Unit** | **UPS power rating** | |
|---|---|---|---|---|
| LAM - version | | kVA | 30 | 40 |
| **Electrical data** | | | | |
| **INPUT** | Voltage | Vrms | 208/220V, 3Ø (+N), + 15%, -25% | |
| | Current (single phase) | Arms | 99 | 132 |
| | Frequency | Hz | 60 Hz | |
| **OUTPUT** | Power rating | kVA | 30 | 40 |
| | | kW | 27 | 36 |
| | Voltage | Vrms | 208V, 220V, 415V , 3Ø+ N | |
| | Current @ 208 Vrms | Arms | 84 | 111 |
| | Frequency | Hz | 60 Hz | |
| | Wave form | - | Sinusoidal | |
| Max dissipation (@ nominal load and battery in recharge) | | W | 3660 | 5850 |
| **Mechanical data** | | | | |
| Depth | | mm | 800 | |
| Width | | mm | 550 | |
| Height | | mm | 1600 | |
| Weight | | kg | 470 | 583 |
| Max. noise level (@ 1m) | | dBA | <58 | |

## Appendix: Planning and installation

### Installation site

Pay attention to the following conditions when selecting an installation site:

- The ambient temperature should be between 0°C and +40°C for UPS devices. For continuos operation at 40°C, reduce the max load by 12% of the nominal load
- The ambient temperature should be between +15°C and +25°C for battery cabinets.
- Be sure to provide sufficient cooling in the installation room so that the ambient temperature remains within the stated limits. The heat emission ratings of the UPS are given in the Technical Data Tables. Be sure also to provide sufficient ventilation for the type of batteries used in the UPS.
- When operating the 80-NET*MPR* UPS at altitudes above 1000m a.s.l., the load must be reduced accordingly (see User Handbook). If the ambient temperature remains less than +30°C, no load reduction is necessary for altitudes up to 2000 m.
- Ensure that the load carrying capacity of the floor is sufficient for the UPS and batteries. The floor must be even and level

Avoid harmful agents such as:
- Vibrations, dust, corrosive atmospheres and high humidity

Allow the following min. distances:
- 50 cm between the top of the cabinet and the roof
- Distance from the wall must be at least 100mm
- No limits on either side of device

### Dimensions with packaging

| Rating (kVA) | Width (cm) | Depth (cm) | Height (cm)* |
|---|---|---|---|
| 30/40 | 73 | 94 | 168 |

*Includes pallet.

- Use a suitable lifting truck to transport UPS and battery cabinets, on the pallet and in the original packaging to the storage or installation site. The equipment must be kept upright at all times and handled with care. Damage may be caused if dropped or subjected to severe impact. When moving the equipment with a forklift, secure it against tilting.

### Max. spacing for fork-lift bars (side)

| UPS (kVA) | 30 | 40 |
|---|---|---|
| max. (cm) | 61 | 61 |

### Installation data

Refer to the User Handbook and the Technical Data tables.

### External dimensions -UPS

| Type | Width (mm) | Depth (mm) | +Front panel[1] (mm) | Height (mm) |
|---|---|---|---|---|
| A 1 | 550 | 800 | 1330 | 1600 |

[1] Space required to open front panel; Front panel opens at 180°

### Weight

- 30 kVA = 184 kg without battery (standard version)
- 40 kVA = 187 kg without battery (standard version)

## Appendix: Planning and installation

UPS current ratings and cable cross sections

| **UPS devices model nominal power kVA** | **30** | | **40** | |
|---|---|---|---|---|
| **Mains 1** U1, V1, W1, N1, PE | a) | b) | a) | b) |
| **Mains 2** U2, V2, W2, N2, PE | | | | |
| Min. conductor cross section[mm²] | 10 | 10 | 16 | 16 |
| Max. possible cross section[mm²] | 16 | 25 | 25 | 35 |
| Recommended fuse (F1) d)[A | 50 | 50 | 63 | 63 |
| **Load** U3, V3, W3, N3, PE | | | | |
| Min. conductor cross section [mm²] | 10 | 10 | 16 | 16 |
| Max. possible cross section [mm²] | 16 | 25 | 25 | 35 |
| Max. permissible selective fuse for loads [A] | 25 | 25 | 35 | 35 |
| **Battery, external + , -** | | b) | | b) |
| Min. conductor cross section [mm²] | | 25 | | 35 c) |
| Max. possible cross section [mm²] | | 25 | | 35 |
| Recommended fuse [A] in each pole (+ and -) e) | | 100 | | 2x63 |
| **Neutral (N)** from mains/ to load N1,N2, N3 oversize | 1.7 | | 1.7 | |
| **Type of connector** | terminals | | | |

a) finely stranded (very flexible) with wire-end sleeve according to DIN 46228
b) stranded (flexible)
c) only with cable open to the air
d) slow-blow type gl
e) a DC adequate fuse must be used!

**Please note:** If an external battery cubicle is present it will be located adjacent to the UPS cubicle.

In the case of a split bypass configuration, the primary input and bypass mains must have a common earth. The neutral conductor may be part of either the bypass or the primary mains, but it must be present.

## Notes

**Chloride Systems**
**WORLD HEADQUARTERS**
Via Fornace 30
40023 Castel Guelfo (BO)
Italy

**T** +39 0542 632 111
**F** +39 0542 632 120
**E** enquiries@chloridepower.com

CHLORIDE

www.chloridepower.com

Closest Chloride Contact in Australia:
**Chloride Australia**
Ground Floor
16 Giffnock Avenue, North Ryde
NSW 2113
Australia

**T** +61 2 9888 1266
**F** +61 2 9888 1966
**E** australia.sales@chloridepower.com

www.chloridepower.com.au

Closest Chloride Contact in UAE:
**Chloride Middle East**
Building 5, Office 104
Dubai Internet City - Dubai
UAE
PO Box 72536

**T** +971 4 391 3205
**F** +971 4 391 6803
**E** middleeast.sales@chloridepower.com

www.chloridepower.com/middle-east

Closest Chloride Contact in South East Asia:
**CHLD Singapore Pte Ltd**
2 Corporation Road
#03-07 Corporation Place
Singapore
618494

**T** +65 6481 4776
**F** +65 6481 0552
**E** singapore.sales@chloridepower.com

www.chloridepower.com.sg

Closest Chloride Contact in UK:
**Chloride UK**
George Curl Way
Southampton, Hampshire
SO18 2RY
United Kingdom

**T** +44 (0) 23 8061 0311
**F** +44 (0) 23 8061 0852
**E** uk.enquiries@chloridepower.com

www.chloridepower.co.uk

Closest Chloride Contact in USA:
**Chloride**
27944 North Bradley Road
Libertyville
IL 60048
USA

**T** +1 847 816 6000 / +1 800 327 8801
**F** +1 847 680 5124
**E** usa.info@chloridepower.com

www.chloridepower.com/usa

Closest Chloride Contact in Thailand:
**Chloride Thailand**
Panjathani Tower, 20th Floor
127/25 Nonsee Road , Chongnonsee,
Yannawa, Bangkok 10120
Thailand

**T** +662 296 9800
**F** +662 681 0109
**E** thailand.sales@chloridepower.com

www.chloridepower.com/th

Closest Chloride Contact in Vietnam:
**Chloride Vietnam**
Unit 1708, 17th Floor, Gemadept Tower
06 Le Thanh Ton Street, Ben Nghe Ward,
District 1, Ho Chi Minh City
Vietnam

**T** +84 8 255 6737
**F** +84 8 255 6800

www.chloridepower.com/vn

For a full list of contacts please visit our website at **www.chloridepower.com**

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